Indoor Health and Productivity (IHP) Project (www.IHPCentral.org)

Background

Interest in the relationship of indoor environmental quality with indoor health and productivity has been growing steadily in recent years. The associated scientific knowledge is available primarily in journal and conference articles that can be difficult to obtain. These articles are dispersed within a broad set of journals and conference proceedings. Most of these articles are not written in the concise format highlighting the practical implications for building professionals. Improving access to and communication of the IHP scientific literature will facilitate:

- development of policies, standards, and best practices guidelines for buildings that have a stronger scientific underpinning, with less reliance on unverified professional judgment;
- evaluations by designers and facility managers of the IHP benefits claimed in product literature;
- increased use of building designs and operational practices that enhance indoor environmental quality, health, work performance, and student learning; and
- more effective diagnosis and remediation of building related health complaints

Objectives

The IHP project aims to develop and communicate to practitioners and researchers a more thorough understanding of the relationships between physical attributes of the indoor environment (e.g., lighting, ventilation and air quality, thermal comfort, etc.), the best practices for operating and maintaining systems that affect indoor environment and worker and student performance/ health. The main approaches are:

- to critically review and synthesize the current state of knowledge in the field of IHP;
- to identify, synthesize and publicize existing scientific findings of special interest;
- to maintain a publicly accessible online bibliography of IHP papers;
- to support IHP research efforts that are exceptionally cost effective, for example, low cost analyses of existing data that can yield important new information.

Sponsors of the IHP Project

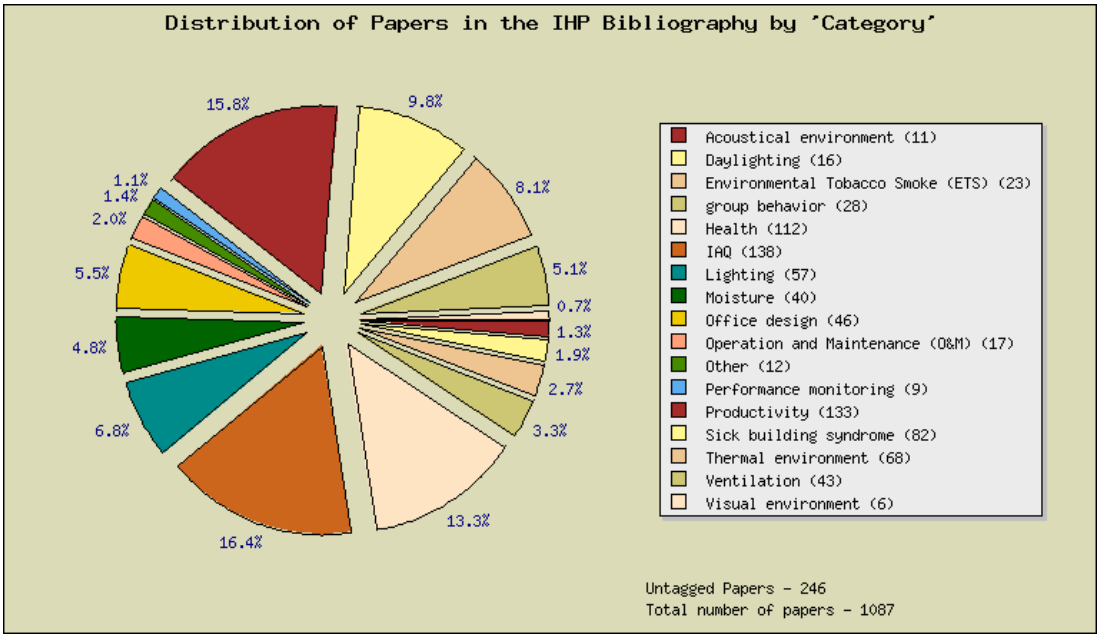
The Indoor Health and Productivity is an interagency project with funding from US Department of Energy, US Environmental Protection Agency, National Institute of Standards and Technology, California Energy Commission, and Southern California Edison (a California utility). Four tasks have so far been funded by the project sponsors and are described in greater detail below.

1 Critical Review of Existing IHP Literature

Under this task, five key IHP papers published in the last ten years were identified by an expert panel and their summaries were developed and published in ASHRAE Journal. The criteria for the selection of the papers were that they should make important contributions towards a better understanding of the influence of IEQ on indoor health and productivity and should provide valuable information to architects and engineers - the primary intended audience for this project. The paper summaries are available at the IHP web site under *Projects*.

2 The Online IHP Bibliography

An online bibliography of research papers has been assembled under the Indoor Health and Productivity project. This bibliographic database can be accessed by visiting www.IHPCentral.org and clicking on the Bibliography link. The online bibliography has close to 1,100 papers/articles from leading journals and conferences addressing the issue of IHP - a majority of them with abstracts. Apart from the full bibliographic information available for each paper in the online bibliography, each individual paper is also tagged to facilitate searching and sorting of the bibliography by *Reference Type* (journal article, conference paper, book chapter, etc.), by *Primary Category* (Health, Thermal environment, Productivity, IAQ, O&M, etc.), by *Study Type* (Analytical study, Experimental research, Literature review, etc.). The figure on the next page shows *Distribution of papers in the IHP Bibliography by "Category"*.



3 Indoor Environment Quality and Student Performance in Schools

A critical review of available evidence on relationships between indoor environmental quality (IEQ) in schools and student performance was performed. The most persuasive available evidence suggests that some aspects of IEQ, including low ventilation rate and less daylight or light, may reduce the performance of occupants, including students in schools. Substantial limitations in the quantity and quality of available research findings suggest many questions for future study. Sufficient evidence is available to justify (1) actions to safeguard IEQ in schools and (2) the conduct of focused, well-designed research to help guide future policies and actions regarding IEQ in schools. The review is available on the IHP web site under *Projects*.

4 CO2 Concentrations and Student Absence

This task is analyzing existing data to determine whether higher CO2 concentrations in elementary-grade classrooms are associated with higher rates of student absence. The associated work is being performed by Washington State University (WSU), which collected the absence and CO2 data from school districts and by Lawrence Berkeley National Laboratory, which is using multivariate statistical models to investigate the associations of CO2 concentrations (indoor minus outdoor) with absence rates after control for potential confounding by other factors that may influence absence.

Future Research Plans

- Develop a market transformation strategy to improve IEQ in existing buildings;
- Continuously update the online IHP bibliography and market it as a research and education tool;
- Conduct critical reviews of the IHP literature on a periodic basis.
- Support for additional IHP research efforts that are unusually cost effective.

For More Information

Please contact:

a) Satish Kumar
Lawrence Berkeley National Laboratory
Email: SKumar@lbl.gov
Phone: 202-646-7953
b) William J. Fisk
Lawrence Berkeley National Laboratory
Email: WJFisk@lbl.gov
Phone: 510-486-5910